

ORIGINAL ARTICLE



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Tutorial: External Ocular Photography

The challenge of external photography is that it appears to be so easy. External photography is an exercise in information transfer. Light encodes physical aspects of the patient into descriptive groups of colors, shapes and lines. Successful external photography conveys specific information concerning tissue size, color, position, asymmetry, motion and modification. Unless we take careful steps to accurately capture this visual information, photographs may fool us by displaying false color, distorted perspective, or insufficient information. This paper describes the tools necessary to create useful external photographs, the standards required to promote their accuracy and a method for successfully completing this clinical procedure.

External ocular photography documents the external eye, lids and ocular adnexa (Figures 1 and 2). Photographs can record the eye and its motion more accurately than physician chart notes or drawings. External photography is used to follow patients for insurance documentation

and for patient and health professional education. Clinical research uses external photographs to objectively document findings. Patient trauma images are useful in legal proceedings, while cosmetic surgeons use photography to document pre-existing conditions. External photography is especially useful when a difficult case must be discussed with a colleague, or when further study of eye movement is required after the patient has left the clinic.

The CPT procedure code **92285 External Photography** describes external photography.³ This code does not differentiate between external and slit lamp photography, between film and digital media, or between still and video images. External photographs are an integral part of a patient's medical records and are subject to HIPAA (Health Insurance Portability and Accountability Act) regulations. The specialists who most often request this procedure include pediatric ophthalmologists and ophthalmic plastic surgeons, although virtually every ophthalmologist may request external photography.



Figure 1: Using photography to document external eye findings has probably occurred since the invention of photography in the mid 18th century. On close examination, this daguerreotype (1839-1860) reveals prominent proptosis.



Figure 2: Early collections of external photography include Ramsay's Atlas of External Diseases of the Eye published in Glasgow by James MacLehose and Sons in 1898 (a), and Greeff's 1909 Atlas Der Ausseren Augenkrankheiten Fur Arzte Und Studierende published by Urban & Schwarzenberg in Berlin (b). This latter text portrays wax models from the Pathoplactic Institut in Berlin.^{1,2}

EXTERNAL PHOTOGRAPHY EQUIPMENT

The obvious first requirement for external photography is a camera. But of what type? Should you choose a film camera; in which case, should it be traditional or instant? Should you choose a digital camera; in which case, how

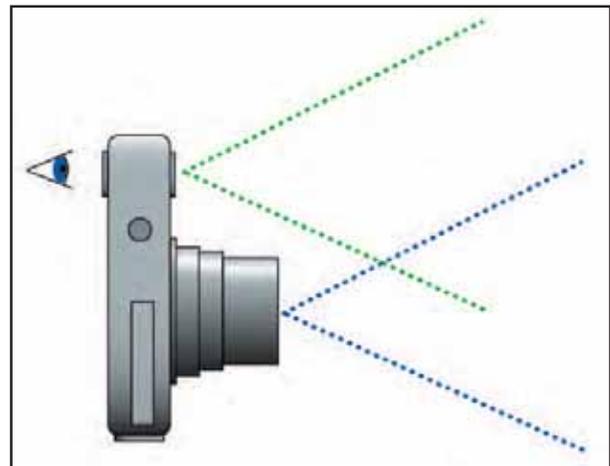


Figure 3: Parallax describes a difference in perception when more than one observer views the same object from slightly different viewpoints. For example, the viewfinder and lens of a rangefinder camera transmit two slightly different views of the subject. This effect is exacerbated as the camera moves closer to the subject. A single lens reflex camera does not suffer from parallax: what you see is what you get. Instant digital or Polaroid images allow immediate evaluation of parallax.

Table 1: Digital cameras use many different chip sizes. This table relates 3 popular chip sizes and their digital lens focal length with standard 35mm lens equivalents. Always look for the "35mm lens equivalent" statement in a fixed lens camera and the "Lens Factor" statement in a digital SLR.

	Sensor Size (mm)	Lens Factor (SLR)	Wide Angle Lens	Normal Lens	Portrait Lens
Digital Chip	7.2x5.3		5.6mm	10mm	21mm
	18x13.5	2.0	14mm	23mm	52mm
	22x15.1	1.6	18mm	31mm	65mm
35mm film	24x36	1.0	28mm	50mm	105mm

many mega-pixels are required? Should the camera be still, or video, or capture both? The short answer to each of these questions is best stated as another question: How will you be using these photographs? Understanding your camera and lens options will help you define your needs.

You could choose a traditional film camera that provides easy to file hard copy using time tested technology. For routine clinical photography, most photographers choose a single lens reflex (SLR) and expose medium speed 35mm color slide film. Each specific camera, film, and processing combination will determine the final photograph's particular color rendition.⁴ Equipping the camera body with a motorized film advance improves framing accuracy because the camera is not moved while winding the film. Inter-changing the standard focusing screen with a grid model improves composition by providing alignment cues in the viewfinder. The SLR creates maximum flexibility by allowing the use of interchangeable lenses (Table 1); and its 'what you see is what you get' viewfinder eliminates the problem of parallax (Figure 3). Image quality is high. Final images are



Figure 4a: Polaroid cameras like the CU-5 provide close focusing and longer focal length optics. *Designed by Marshall Tyler, CRA, FOPS.*

suitable for publication or can be digitally scanned for PowerPoint presentations and web pages.

Polaroid® cameras provide rapid results without dependence on outside processing⁵ (Figure 4). The instant prints assist with immediate patient education and can easily be slipped into an envelope or folder in the patient's chart. A negative feature is that image quality suffers because of the film's low resolution and the wide angle nature of many instant camera lenses.

If electronic medical records, PowerPoint presentations, or web usage are your primary goal, then it makes sense to begin with a digital image.⁶ Each specific digital camera brand and model will exhibit inherent characteristics that affect color rendition and contrast. Examples of this include chip size (larger chips enhance image quality) and chip type (CCD, CMOS, and Foveon chips all render colors slightly differently). To preview the quality of your future images, consider obtaining an image from the specific camera model before making a major purchase decision. The specific digital camera settings you choose will affect the final image quality. Lower ISO choices result in higher signal to noise ratios when no additional lighting is used. Lower compression ratios mean finer detail, but larger files. In decreasing order of image quality, but increasing order of workflow speed, digital file formats choices include raw, .tif, or .jpg. Each step in the digital imaging chain (camera, operating system, software, color standards, monitor characteristics, room illumination, printer settings, and ink and paper choices) will affect how your final image looks.

Specific digital camera recommendations become quickly outdated as the industry continues to evolve at a rapid pace. The lowest priced small sensor digital SLR that is compatible with traditional SLR lenses is priced in the



Figure 4b: The instant images can be used for patient education, then labeled and filed in the patient chart.

five hundred dollar range, while a digital SLR with a full frame (35mm sized) chip is about three thousand dollars (2006). These 6-14 megapixel cameras provide appropriate color reproduction and resolution for medical imaging projects. Large image files should not be a cause for concern if you keep your computer and storage media up to current specifications. The purpose of the image also affects your capture resolution choice. A publication quality 7x10, 300 dots per inch (DPI) .tif file requires a 6 megapixel capture, while a screen resolution (web/PowerPoint use) 7x10, 72 DPI image requires only a 1 megapixel capture resolution.

Purchase extra media cards and a card reader to transfer the images from your camera to your computer. Proactively develop a strategy for tracking your patient image files electronically, whether it is as simple as naming the images with a patient number and filing them electronically in a set of appropriately named folders, or entering them into your electronic medical record or digital angiography system.

Avoid inexpensive consumer cameras (1-2 mega-pixel), as their low pixel resolution will not adequately capture fine detail (Figure 5). Before purchasing a mid- or high-range non SLR consumer digital camera (4-8 or above mega-pixels), check the camera's macro focusing function and for any wide angle distortion when focusing closely. Use the electronic viewfinder of the digital camera to overcome any parallax error which may be evident in the optical viewfinder. Hold the camera in your hands and evaluate how easily you can change settings.

The appropriate camera recommendation for your practice depends upon your specific clinical situation. If you have a small practice with paper charts and an occasional need for external photography, the Polaroid solution may be adequate. A teaching institution with access to a digital angiography system (which should be able to accept your

digital external photographs) and dedicated ophthalmic photographers will require the flexibility of a digital SLR. If you are uncomfortable with computers, choose film. If you are migrating to electronic medical records, choose digital. If publication quality images are important, choose at least a 6 mega-pixel digital camera. In general, the more money you spend on your camera and lens, the greater will be the image quality and flexibility.

Documenting nystagmus or blepharospasm and recording motion during motility studies requires video recording. If light use is encountered, the low resolution, thirty-second .mpg video clips available on still digital cameras may be useful. For sustained use, we suggest a high quality digital video camera with a rotating liquid crystal (LCD) screen. By rotating the viewfinder screen, you will be able to monitor progress from the patient position while moving a fixation device or manipulating lids. Video resolution is 640x480 pixels, or about 0.3 mega-pixels. Auxiliary close-up lenses may be useful for decreasing the minimum focusing distance. The patient video can be downloaded into your personal computer using a Firewire connection (IEEE 1394), or inserted into the computer from a camera direct CD or DVD. Some newer video cameras record directly onto internal hard drives, simplifying video transfers to your computer. Using video editing software (Adobe Premiere, Ulead Video Studio, Apple iMovie or Final Cut Pro) and a DVD recorder will facilitate archiving video material and preparing video clips to insert into presentations. Selected frames can be saved as .jpg files for posters or publication.

The business of a camera body is to capture and record light. The business of the lens is to gather and focus the light. Long and short lenses may distort the way we perceive human anatomy, causing normal perspective relationships of the face to look distorted (Figure 6). Ophthalmic external images generally fall within the reproduction range of 1:10 to 1:1 which will require your lens to have macro, or close focusing, capability. We recommend a portrait lens that has macro capability, such as the camera manufacturer's 90mm macro lens or a 'Medical' lens that includes a built-in ring flash. If you are using your camera's built-in zoom lens, choose a consistent, moderate telephoto setting, adjusting your distance from the subject to alter your field of view.

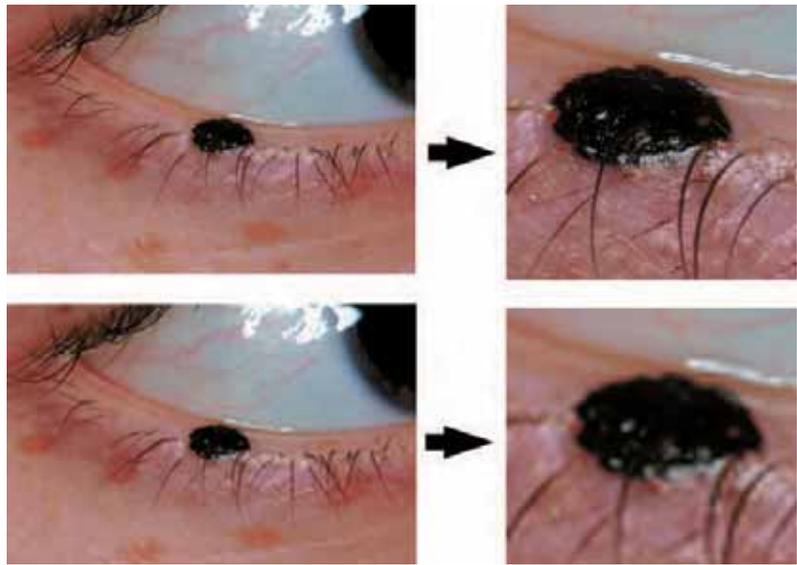


Figure 5: Future cropping and enlargement decisions may impact your choice of a digital camera system. A high resolution, 8 mega-pixel image of this lid lesion loses little when enlarged (top), while the enlarged 1 mega-pixel image loses contrast and detail (bottom).

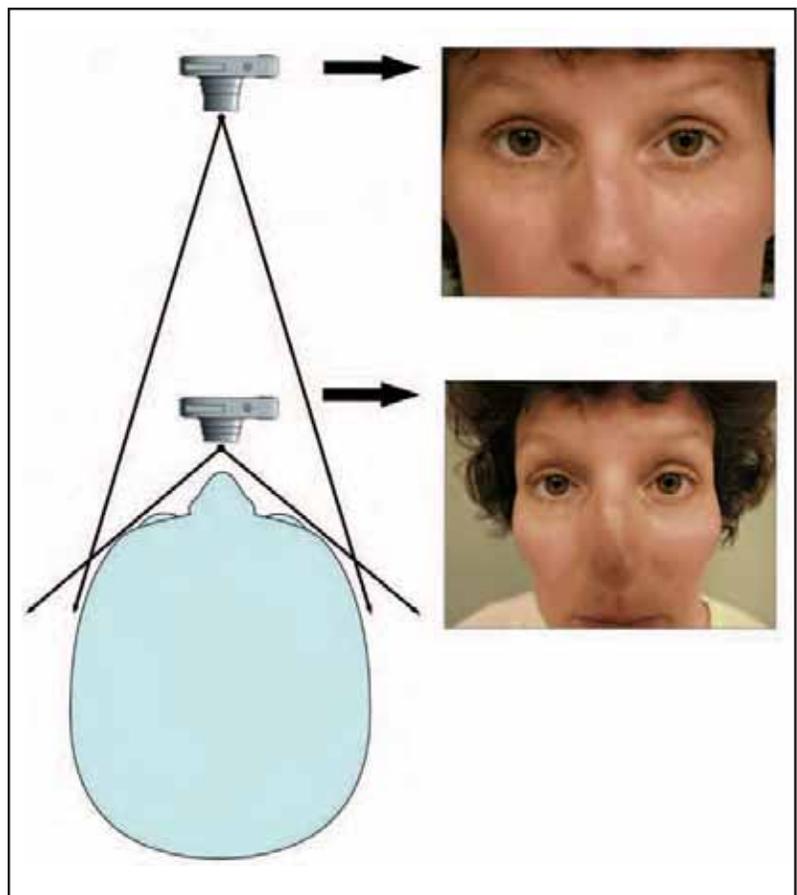


Figure 6: The focal length of a lens determines the working distance for a particular magnification. Portrait lenses (90-120mm focal length for 35mm format) simulate the natural perspective of interpersonal communication (top). Shorter focal lengths produce distorted perspective by requiring close working distances (bottom).



Figure 7: Your external camera can be used to acquire images in the operating room. In this image, a temporal artery biopsy is being performed.

The light used to expose the image can vary in color, character, direction, and intensity. Flash is the illumination of choice for clinical patient photography. For most ophthalmic clinics, a single light source is suggested.⁷⁻¹¹ Large soft-box and multi-flash set-ups have been suggested and are favored by specialists in plastic surgery.¹²⁻¹³ A single light provides one set of shadows, mimicking our natural light source: the sun. The one light method also enhances the portability of the system,

allowing the photographer to visit the patient at bedside or during surgery (Figure 7). Providing light for your patient photographs using either tungsten light bulbs (yellow) or fluorescent lights (green), may cause unnatural discoloration (Figure 8).

The position and size of the flash determines exposure and the character of the light in the final photograph. For general photography, the flash is traditionally located on the top of the camera. This placement can cause 'flash parallax' (the area illuminated by the flash is different from the area the objective lens images), especially when focusing closely. Attaching the flash unit to the front of the lens is suggested for close focusing situations. The position of the flash induced corneal light reflex (first Purkinje image) can be used to help assess strabismus.¹⁴

The relationship between the physical size of the flash diffuser and the size of the subject determines the depth and intensity of the shadow detail. Like the direct sun on a bright day, small, point source flash units delineate fine detail; but also create harsh shadows that obscure detail, especially in cavities¹⁵ (Figure 9). Many photographers prefer small sized light sources that allow them to create additional texture by raking the light across the subject. Similar to the sun on a cloudy day, a diffused or ring flash provides even illumination which penetrates cavities, but can also create large reflections on shiny surfaces.

Figure 8: If an image is exposed using standard daylight film, tungsten light photographs (top) have an orange cast and fluorescent light photographs (center) are green. This color cast can be avoided by using electronic flash to overpower ambient light (bottom). If a flash is unavailable, place a blue 81A filter (or FLD/30CC magenta filter) over the lens to correct tungsten (or fluorescent) for daylight film. If your camera is digital, set the white balance control to the 'tungsten' or 'fluorescent' settings in situations when there is a single type of light source and to AWB (Auto White Balance) when light sources are mixed.



Figure 9: Hard shadows can either increase information by revealing texture or decrease information by obscuring detail. When comparing these two photographs, notice that the shadows from the hard light (top) leave the upper lids in darkness while the soft light from the large source (bottom) reveals the upper lids.



Figure 10: The Nikon SB29s Macro Speedlight (left) and Canon Macro Ring Light MR-14EX (right) are examples of modern macro flashes that attach to the front ring of an SLR lens. They use multiple light panels that can be controlled independently.

Some surgeons prefer the even illumination of ring lights as they allow the tissue to speak for itself, without additional emphasis from lighting placement. Newer macro flashes incorporate lighting panels with individual on-off switches, permitting the photographer to choose between directional and non-directional light (Figure 10).

Other useful tools to keep in your external patient photography kit include:

- close-up lens filters to extend the reach of your macro lens
- metal rulers for showing size
- small plastic toys and a light for pediatric fixation devices
- cotton tipped applicators (sometimes dyed black) and gloves for retracting and everting eyelids
- cloth or paper background on which to set spectacles or a prosthesis for photography (Figure 11)



Figure 11: A simple surgical drape serves as a background to document this prosthesis after exenteration.

EXTERNAL PHOTOGRAPHY STANDARDS

Camera and lens in your hands; patient in front of you; but you're still not quite ready to shoot. What's missing? The photograph's background, a precise framing and focusing plan, and your exposure strategy. Standardization in these areas will enhance both the quality of the images and the efficiency of the photography.¹⁶⁻¹⁸

The background color used in a patient photograph influences your perception of that patient (Figure 12). Begin by eliminating clutter in your backgrounds. Avoid



Figure 12: Neutral gray or medium blue (a) backgrounds are suggested. Black (or white) backgrounds may be problematic as there may be no contrast between the background and dark (or light) hair. (b) Bright colors and busy backgrounds draw the eye away from the subject. (c)

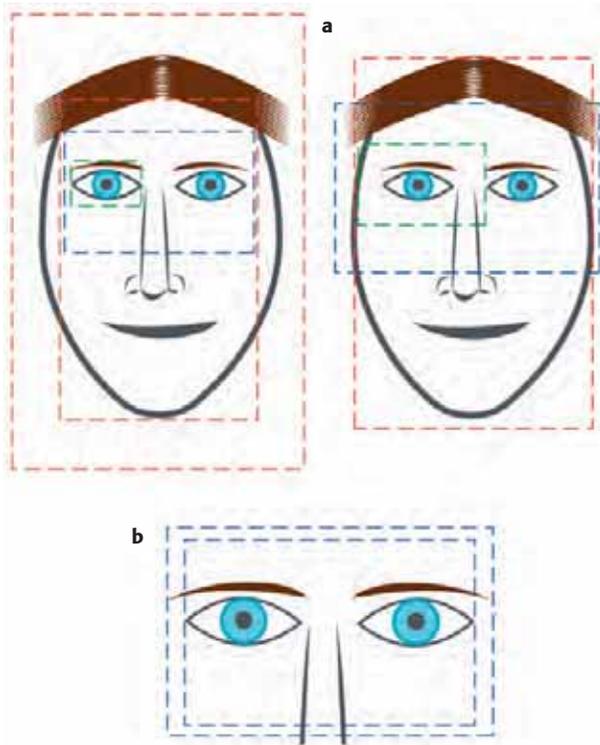


Figure 13: The anatomic method of framing uses defined facial landmarks to obtain consistent views. For example, a full face image may be defined as either neck to top of hair or chin to hairline. (a: left) Images of both eyes may be framed from brow to brow for plastics or from temporal canthus to temporal canthus for strabismus. (b)

The reproduction ratio method uses a standard set of magnification ratios to obtain consistent views. All full face photographs (regardless of head size) are photographed at 10:1; all OU views at 4:1. (a: right)

Table 2: The following magnifications are suggested when using a rigid reproduction ratio method of framing photographs.²¹ These reproduction ratios are engraved on high quality macro lenses.

	Reproduction Ratio
Full Face	10:1
OU	4:1
Orbital Region	2:1
Single Eye	1:1

photographing your patients in front of ophthalmic equipment. Dedicate a blank wall (painted an appropriate color) and place a single patient chair in front of it. Plan the space so that there is enough room for you to retreat from the patient to easily photograph a full face image and to move laterally for obtaining oblique views.

Shoot multiple images of each patient incorporating different fixation or framing, multiple angles, with eyes open or closed. Standards in framing ensure reproducibility between visits and appropriate comparison between patients.

There are two standard approaches to composition: the anatomic method and reproduction ratio method (Figure 13). The anatomic method relies upon a set of patient landmarks to define the composition.¹⁹ For example, plastics photographs OU (both eyes) are framed from the outside edge of one brow to the outside edge of the other. This method allows for easy visual comparison between patients, especially when a difference in head size exists. The reproduction ratio method relies upon a specific set of predetermined magnification ratios that are pre-selected for certain clinical situations.²⁰ For example, all OU photographs are imaged at 4:1 (Table 2). This method facilitates accurate measurements. True physical size can be calculated from the final photograph. However, body size can vary, sometimes significantly, between patients. This creates a wide variation in the tightness or looseness of the framing. Each practice should

Table 3: Suggested External Ophthalmic Photography Views

Condition	Suggested Views	Options and Comments
Blepharoptosis	OU with patient's brows normal, raised, relaxed	OU with patient looking straight ahead, up, and down
Conjunctival Inflammation	OU, single eye	Retract lids and direct gaze to expose area of interest.
Cornea Conditions	Slit Lamp Photography	
Ectropian	OU, single eye: primary position & patient looking up/camera pointing down	Have patient squeeze lids. Corneal slit lamp photographs showing abrasion
Entropian, Trichiasis	OU, single eye: primary position & patient looking up/camera pointing down	
Marcus Gun Jaw Wink	Full face with: mouth closed, mouth open (drop chin), & jaw to right and left	
Proptosis, Orbital Fracture	Full face, side & 3/4 profile	OU from above: patient leaning forward OU from below: patient leaning back Radiographic images
Punctum	Establishing shot, High magnification (1:1 – 2:1)	Direct gaze in opposite quadrant to reveal punctum.
Skin Lesions	Establishing shot, OU, single eye, close-up	Move as close as required. Manipulate lids as required.
Strabismus	Nine cardinal positions of gaze	Natural and forced primary showing head tilt Bielschowsky response: OU at 45° Videotape as requested
Systemic Conditions	Full face, OU, single eye	Any other body parts involved
Trauma	Full face, OU, single eye	Document any objects and radiographic images involved. Monitor any pressure on globe when retracting lids.

determine the standardized framing method that best serves their needs.

Standardized views are required to produce comparable pre- and post-surgery images. Additionally, the photographer can more efficiently document regularly occurring patient findings by implementing standardized sets of patient photographs (Table 3). A photographic series for strabismus should include OU photographs of the nine standard directions of gaze. If the patient presents with a head tilt, photograph a full face view in both the natural and forced primary positions. Document blepharoptosis using OU photographs with the patient looking straight ahead normally, then again with the eyebrows raised, and again with the eyebrows relaxed (an optional ptosis series documents the patient looking straight ahead, up and down). To document proptosis, begin with a full face view, photograph each side of the patient in 3/4 and profile views, then photograph a double eye view from above (with the patient's head tilted forward) and below (with the patient's head tilted back). Show Marcus Gunn jaw wink by photographing



Figure 14a-d: Marcus Gunn jaw winking syndrome, or external pterygoid-levator synkinesis, is caused by abnormal innervation of the levator muscle of the 5th cranial nerve. Document this condition using four full face images: normal (a), jaw dropped (b), and jaw rotated to each side (c,d).

the patient's full face normally, with the mouth wide open (jaw down), and with the jaws shifted to the right and to the left side. (Figure 14) Suggested lid margin photographs (trichiasis, ectropian, entropian) include straight ahead views of both and single eyes and lid photographs with the patient looking up and the camera pointing down.

EXTERNAL PHOTOGRAPHY PROCEDURE

Obtaining external photographs consumes more time than the fraction of a second required for exposure. Proper preparation, standardized technique, and careful follow-through are vital to consistent and successful external photography.

PREPARE & POSITION

The external photography procedure begins by reviewing the physician completed External Photography Request

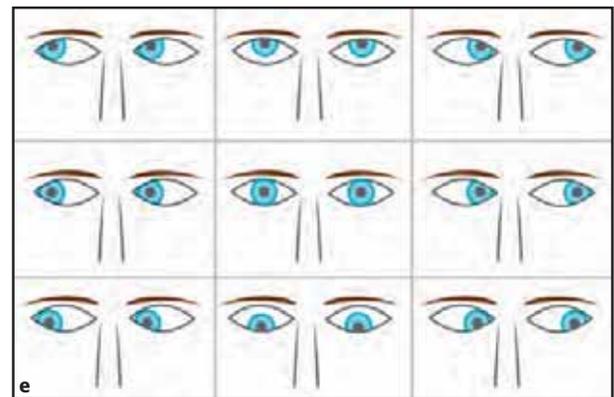


Figure 14e-g: Photographing the 9 gazes of view (e) documents variation in the behaviour of the eight extra-ocular muscles. (f) A patient with thyroid eye disease is used to illustrate the nine gazes of view. (g) Courtesy Chris Barry, CRA, FOPS

OPHTHALMIC PHOTOGRAPHY REQUEST FORM	
Anterior Segment	
Date _____	Physician _____
VA: Hx/Dx: _____	_____
Signature _____	
External Photography	
<input type="checkbox"/> Full Face <input type="checkbox"/> Natural primary <input type="checkbox"/> Forced primary (y) _____ <input type="checkbox"/> Side R L R L <input type="checkbox"/> OU (mark gaze) <input type="checkbox"/> Hold lids down (gaze) <input type="checkbox"/> DO NOT hold lids down (gaze) <input type="checkbox"/> Single eye: <input type="checkbox"/> OU <input type="checkbox"/> OD <input type="checkbox"/> OS <input type="checkbox"/> Lids <input type="checkbox"/> Upper <input type="checkbox"/> Lower <input type="checkbox"/> Trichiasis <input type="checkbox"/> Document ptosis (FF, side, 2/4 above/below)	
Corneal Photography	
<input type="checkbox"/> Slit Lamp Photography OU OD OS (Please sketch or describe) Stain: <input type="checkbox"/> Fl. <input type="checkbox"/> Rose Bengal	
<input type="checkbox"/> Gonioscopy OU OD OS (Please sketch or describe)	
<input type="checkbox"/> Endothelial Cell Count OU OD OS	
PHOTOGRAPHER Coop. <input type="checkbox"/> Good Notes: <input type="checkbox"/> Fair <input type="checkbox"/> Poor	Consent for Photography Date _____ I hereby authorize employees of DHMC to interview me, photograph, or otherwise illustrate portions of my anatomy. I further agree that they may use, and permit others to use information, slides, negatives, prints, and other video, audio, or digital recordings for medical, scientific, educational, and other related purposes. Signed _____ Witness _____
MD SIGNATURE _____ (Reasons: White - Eye Chart, Yellow - Medical Record)	Rev 12/97 0-3580

Figure 15: Sample of an external/anterior segment photography form.

Form (Figure 15) and any previous photographs of the patient. A properly completed form will help the photographer recognize the patient's findings from the physician's viewpoint. Minimally, a diagnosis and location are suggested. The greater the detail written or drawn on the form, the better the final images will be. Reviewing previous patient photographs helps the photographer to frame identical views and choose similar points of focus. This is especially important when documenting pre/post findings.

Complete the appropriate paperwork and prepare the external camera (power up, load film or media card) before the patient enters the room. If you are using film, photograph a nametag to act as a guidepost during editing. If you are shooting digitally, enter the patient's demographics into your computer.

Seat the patient in a stable chair against the available photographic background. A headrest may be used to keep the patient steady. Ask the patient to sit straight and align their head so that the central axis of their face is perpendicular to the floor and the frontal plane of their face is parallel to the plane of the wall behind them. The patient's Frankfort line (imaginary line between the auditory canal to the infra-orbital rim) should be parallel to the floor. The photographer sits on a height adjustable stool with the center of the lens at the height of either the patient's eyes (OU and single eye photographs) or nose (full face



Figure 16: A different primary fixation can be obtained with the right and left eye in some strabismus patients.

images). The camera should be held so that the film plane is parallel to the plane of the patient's face. Most standard photographs will be imaged from this primary position.

Before beginning the session, review the patient's anatomy and plan the specific set of views required to document the findings. If the patient has been administered topical sodium fluorescein (ideally, they have not), then rinse the eye. Ask the patient to remove distracting jewelry and glasses. Hair should not obstruct the view of any findings.

EXPOSE

Always begin a photographic session with an establishing shot, choosing either a full face view or a view of both eyes. Instruct the patient to fixate 'straight ahead' to establish primary fixation (Figure 16) and to avoid the appearance of daydreaming. Carefully frame and focus the image, centering the subject, checking the edges of the viewfinder for intersections with the subject. At the same time, direct or motivate the patient as needed. Patients often blink at the wrong moment, move at the expectation of the bright flash, or, in the case of some pediatric patients, become a moving target. Expose as many photographs as necessary to obtain the required view.

As you focus the image, consider the large variety of planes you have to choose from: from the tip of the nose



Figure 17: Always begin with an establishing shot, moving closer to uncover additional characteristics, as in these photographs of meibomian gland cancer.

to the back of the ears. Think about the layers of skin, muscle and bone, and about how your specific choice of focus affects their rendition. Routine photographs are best focused on the eyelashes at the lid margins or on a bright reflex on the cornea. You may find it useful to pre-set the magnification and 'rock' slightly forward and backward to obtain precise focus. Disable auto-focus features, as they are difficult to control at macro settings.

Select a standard exposure setting through empirical testing. Expose images of three colleagues at multiple magnifications, then choose the best aperture and shutter speed setting. The variety in skin and lesion coloration may require you to change your normal exposure setting. Use the histogram function on your digital preview screen to confirm the proper exposure.

The efficient photographic session moves successively from 'large view' to 'small view'. Expose the full face, then

OU, then a single eye, then smaller details (Figure 17). Compose your photographs to maximize the ratio of information to picture surface. Select horizontal or vertical framing as the subject calls for it. You will usually want to fill the frame with important details, but remember that an area of concern can only be appreciated when some amount of the normal surround is included within the frame (Figure 18). You will usually want to center the area of interest, unless you are including a landmark for position information, or are centering the eye and focusing on the area of interest (Figure 19).

Prompt the patient to change the direction of gaze or open and close their eyes as required. Efficiently expose the standard nine gaze series as follows: patient looking straight ahead, to the right, up and right, up, up and left, left. Then, with the upper lids retracted: straight down, down right, down left. Request the patient gently



Figure 18: While useful, the close-up image of a single eye of this patient with dacryocystitis (a) does not tell the whole story because it lacks context. Photographing both eyes (b) demonstrates the unilateral aspect, while a 3/4 view documents the extent of the infection (c).

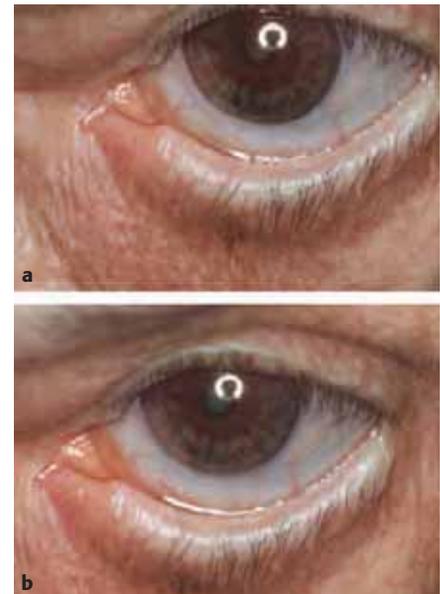


Figure 19: Center the subject for most clinical photographs. If a single eye is involved (a), consider centering the eye and focusing on the subject (b).



Figure 20: Have a second professional use cotton tipped applicators or gloves for retracting lids, as in this patient with scleritis with SLE.

close their eyes to reveal upper lid findings or document lagophthalmos. Incorporate patient triggers to better document blepharospasm (reading or bright lights) and ectropian (request patient squeeze lids).

Cotton tipped applicators or gloves should always be used when retracting lids (Figure 20). A two person technique is more efficient for two eye down-gaze views and upper lid eversions. If only one lower lid need be retracted, then the index finger of the patient (positioned slightly out of the frame) may be called upon.

Deviate from the rigid 'straight camera' alignment as needed, capturing as many views as necessary to tell the story. Show natural head tilt with a wide full face view, then straighten the head ('forced primary') to document motility changes (Figure 21). Demonstrate swelling, proptosis and orbital fractures by rotating the patient's head at a 45° angle and focusing on the eye of concern, or by tilting the patient's head forward (or backward) and photographing from above (or below) (Figure 22). Document OU views straight ahead and with the patient's head tilted at a 45° angle (each side) to document a Bielschowsky response (Figure 23). When photographing ectropian,



Figure 21: The natural head tilt of this patient with Brown's Syndrome is documented with generous full face framing (a). The head is then straightened into a forced primary position (b).

complete the straight ahead views, then have the patient tilt their head forward and raise the camera to better document the intersection of the lid margin with the globe (Figure 24). For punctum photographs, select your highest magnification, and then, pressing the lower cheek (or upper lid) down and nasally, direct the patient's gaze up (or down) and temporally. Ophthalmic patients may have systemic findings that require additional photographs of findings not in the periorcular region.²² Remember to photograph in stereo when the pathology is appropriate.

Approach each photography session as an opportunity for creativity. After you have exhausted your standard photographic routine, but before you release the patient, stop and ask yourself how you can best document the patient's condition or how you can best tell this patient's story.

FOLLOW-UP

Have your color film promptly developed by a professional processing laboratory. Quality processing and timely delivery are both important factors to consider when selecting a film processing vendor. Edit and label the film promptly, marking each slide with the patient's number, the date taken and the referring physician. If shooting Polaroid, the best time to jot the patient name, number and date on the white border surrounding the image is immediately after the exposure.

Load digital images into your computer, making prints as required for referring physicians or paper chart. Edit the images, keeping the best photographs and deleting the rest. Always take some time during the editing process to examine your work with an eye toward improving the quality of your images. How could this photograph have been more effective? Would additional photographs have helped in documenting this case?



Figure 22a-d: Proptosis is documented in a patient with thyroid eye disease using frontal full face and both eye views (a, b), as well as profile views of each eye (c, d).



Figure 22e-h: Tilting the patient's head back and photographing from below (e, f) is another useful technique that demonstrates proptosis in this second patient with thyroid eye disease. A double eye view, from both the inner and outer canthi vantage points (g, h), is used to document upper lid edema.

INTERNET RESOURCES FOR MEDICAL PHOTOGRAPHY AND CLOSE-UP EQUIPMENT

www.bca.org, www.canfieldsci.com, www.dinecorp.com, www.opsweb.org, www.steves-digicams.com

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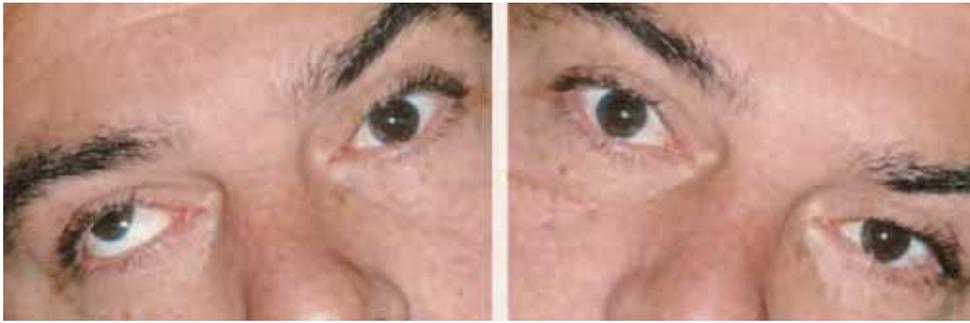
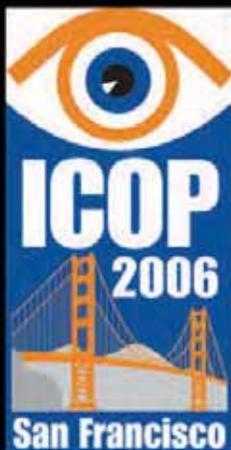


Figure 23: This patient presented with fourth nerve palsy. As he tilted his head to each side, his canthi were aligned with an invisible line that intersected the top and bottom corners of the frame.



Figure 24: An enlarged tear lake is evident in this straight-on image of a patient with ectropion (a). Photographing from above while directing the patient to look up documents the lax intersection between the lid margin and the globe (b).

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